Nuclear Information and Resource Service
1424 16th Street NW Suite 404
Washington, DC 20036
Tel. 202 328 0002

June 13, 2003

Director
New Reactor Licensing Project Office
Office of Nuclear Reactor Regulation
Mail Stop 0-4D9A
U.S. Nuclear Regulatory Commission
Washington, DC 20036

By Email: esprs@nrc.gov

NUCLEAR INFORMATION AND RESOURCE SERVICE (NIRS) COMMENTS ON NRC ADDITIONAL DRAFT GUIDANCE FOR REVIEW STANDARDS OF EARLY SITE PERMIT APPLICATIONS

To Whom It May Concern:

On behalf of Nuclear Information and Resource Service (NIRS), I am submitting comments as noticed in the Federal Register, April 17, 2003 (Vol. 68, Number 74) on Pages 19038-19039 regarding U.S. Nuclear Regulatory Commission (NRC) draft guidance for Commission review standards of early site permit applications.

NIRS finds the draft guidance for the review of Early Site Permit (ESP) Applications for 15.0 Radiological Consequences of Design Basis Accidents to be significantly inadequate, arbitrarily narrow in its scope and does not provide a complete or sufficient analysis to provide reasonable assurance for the protection of the public health and safety in its Early Site Permit safety analysis.

NIRS focuses its comments on the review standard in question as it applies to postulated Design Basis Accidents radiological consequences for the exclusion area boundary (EAB) and the low population zone (LPZ).

NRC describes "A low population zone of such size that an individual located at any point on its outer boundary who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive a total radiation dose to the whole body in excess of 25 rem or a total radiation dose in excess of 300 rem to the thyroid from iodine exposure.."[1]

[1] 10 CFR 100.11 (a)(2), http://www.nrc.gov/reading-rm/doc-collections/cfr/part100/part100-0011.html

1) The draft guidance for the ESP does not adequately address the clear and present danger from deliberate acts of terrorism/sabotage as it directly impacts the resultant radiological consequence and associated increase in risk to the public health and safety.

a) The draft guidance 15.0 states that the staff has determined for the purpose of the ESP review "that the certified standard reactor designs meet the radiological consequence evaluation factors identified in 10 CFR 50.34(a) (1), provided that the site parameters are consistent with the assumptions made in the design certification.

NIRS disagrees.

None of the certified standard reactor designs have been evaluated for radiological consequences to the public against the level of sophistication and ferocity of the attacks on the World Trade Center and the Pentagon as successfully demonstrated on September 11, 2001, where the reactor is contemplated as a pre-deployed weapon of mass destruction used to disperse catastrophic amounts of radioactive inventory.

Four commercial jet airliners were separately hijacked in coordinated attacks with three aircraft successfully reaching designated targets to inflict mass causalities. At least 19 suicidal hijackers coordinated in four teams were directly involved in these attacks. A still undetermined number of conspirators were involved in financing, planning and logistics.

USA Today analysis provided on June 10, 2003 documents that thousands of airports are within 60 miles of current nuclear power plant sites and 52 airports are within 5 miles of nuclear power plants. The USA Today article reports that "aircraft based at many of these airports are largely unguarded and could reach a nuclear site within minutes."[2]

The issue is largely unresolved as "Congress and the accountable federal agencies, facing high-cost solutions and political pressure, have done little to address the threat. The nuclear industry considers it an airport security issue. Aviation interests are opposed to restrictions that might limit access to the skies."[3]

The current ESP site parameters analyses for radiological consequence do not adequately address the location of the perspective site to commercial, general aviation and civilian airports that could be successfully hijacked, stolen, rented or privately owned aircraft and diverted from established and closely adjacent flight paths for the purpose of activating a nuclear power station as a pre-deployed weapon of mass destruction through the breach of containment and dispersion of its radioactive inventory. The NRC currently considers and consequentially trivializes aircraft hazards through a Probabilistic Risk Assessment of collisions occurring only as the result of accident, pilot error, etc.

---

[2] "Nuclear plants near airports may be at risk," Gary Stoller, USA Today, June 10, 2003
[3] Ibid.

b) The draft guidance states that staff has determined for the purpose of the ESP applications that use of the Plant Parameter Envelop (PPE) approach is sufficient to enable staff to conduct its evaluation of the radiological consequence standard.

NIRS disagrees.

Similarly, the Plant Parameter Envelop does not evaluate nor address the radiological consequences resulting from the level of sophistication and ferocity of the attacks on the World Trade Center and the Pentagon successfully demonstrated on September 11, 2001 where the reactor is contemplated as a pre-deployed weapon of mass destruction

Similarly the ESP and the PPE do not adequately address the location of the site to commercial, general aviation and civilian airports that could be successfully used to deliver a hijacked, stolen, rented or privately owned aircraft for the purpose of activating the nuclear power station as a pre-deployed weapon of mass destruction through the dispersion of its radioactive inventory.

Furthermore, the Atomic Energy Commission document "Procedures and Criteria In Safety Evaluation of Nuclear Facilities," June 06, 1957 notes under the section for Site Selection:

"It is impossible to evaluate the safety adequacy of a given site independently of a consideration of the type of reactor to be located there, its characteristics, and the type of facilities to be associated therewith." [4]

Both the current and proposed revised Design Basis Threat (DBT) do not evaluate present or proposed future nuclear power station designs to the level of attack already experienced on September 11, 2001. The number of attackers falls significantly short of the 19 attackers involved in four coordinated attacks by air.

c) The ESP radiological consequence evaluation factors have not fully considered nor weighed all relevant NRC studies regarding a radioactive release as the result of a deliberate act of terrorism/sabotage.

The NRC and the nuclear industry have repeatedly denied the vulnerability of nuclear power plant containments in standard designs in operation and certified designs contemplated for new reactors. The Commission, the NRC Office of Public Affairs and the nuclear industry have all touted containment as indestructible, often citing a 1988 test by Sandia National Laboratory as the empirical evidence of the robustness on nuclear power station containments' ability to withstand aircraft penetration and thus trivializing the radiological consequence from the subsequent penetration and breach of containment.

Contrary to these statements, the NRC and the industry were recently exposed for obfuscating the vulnerability of containment structures and the subsequent radiological

[4] "Procedures and Criteria In Safety Evaluation of Nuclear Facilties," Clifford Beck, US AEC, April 12, 1957, p. 1.

consequence from a breach of containment as the result of an aircraft penetration. Sandia National Laboratory spokesman John German, when asked by the New York Times if this 1988 test proved that an airplane could not penetrate a reactor containment building, stated for the record:

"We've been trying like heck to shoot down this rumor."[5]

"Mr. German said: 'That test was designed to measure the impact force of a fighter jet. But the wall was not being tested. No structure was being tested."[6]

Argonne National Laboratory in a report provided to NRC "Evaluation of Aircraft Crash Hazard Analyses for Nuclear Power Plants" advised the agency with the following conclusion:

"Based on the review of past licensing experiences, it appears that fire and explosion hazards have been treated with much less care than the direct aircraft impact and the resulting structural response. Therefore, the claim that these fire/explosion effects do not represent a threat to nuclear power plant facilities has not been clearly demonstrated."[7]

The proposed standard only looks at the radiological consequence derived from the reactor core. In fact, there is much larger inventories of radioactivity located outside of the reactor core in much less robust structures, with less safety backup features, and with less security. These inventories are largely constituted by irradiated fuel storage ponds and dry casks.

Explosion and fire analyses have direct bearing on radiological releases and consequence to the public health and safety. If the NRC has not done the requisite analyses on the radiological consequence of a deliberate attack on a nuclear power plant with a commercial, general aviation or explosive-laden private aircraft how can they accurately postulate radiological consequence to the public health and safety?

The same would be true for coordinated paramilitary-style attacks by water and/or land on nuclear power plant target sets resulting in core damage, damage that would drain down the irradiated fuel storage pond or breach multiple dry cask potentially lofting a catastrophic release of radiation by explosion, fire and smoke.

Without the inclusion of these analyses which are germane to radiological consequences from deliberate acts of terrorism and sabotage, site expansion through the ESP should not be contemplated until these security-related and cost-driven issues as they directly affect the potential radiological consequences to the public health and safety are openly addressed through an independent and democratic process outside of the promotional

[5] "Experts Say Nuclear Plants Can Survive Jetliner Crash," Matt Wald, New York Times, 09/18/2002.
[6] Ibid.
[7] "Evaluation of Aircraft Crash Hazards Analyses for Nuclear Power Plants," Argonne National Laboratory, 1982.

interest of the Nuclear Regulatory Commission and a corporate expansion agenda of the nuclear power industry.

2. The draft guidance for the radiological consequence standard for the ESP does not adequately address known adverse to public safety and health factors and conditions affecting the reasonable assurance of the successful execution of Emergency Planning and Response in the event of a nuclear accident or deliberate act of terrorism/sabotage on the reactor, the irradiated fuel storage ponds and the on-site irradiated fuel dry cask storage installations.

NIRS contends that there are numerous examples where adverse factors and conditions exist for emergency planning and response regarding radiological consequence that are not being addressed under the radiological consequence standard with reasonable assurance.

The NRC criteria for determining low population density as described in Code of Federal Regulation, 100.11 "Determination of exclusion area, low population zone, and population center distance" states "an applicant should assume a fission produce release from the core."[8]

NIRS is not only concerned about the core but finds that significantly larger inventories of radioactivity are located on-site but outside the containment building in far less robust and less protected structures than the reactor core inventory.

These additional inventories have significant radiological consequence if breached and lofted into the atmosphere or into the water and therefore should not be ignored.

For example, the NRC report "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" assesses the effects of a used-fuel or irradiated fuel fire that would be triggered if the pool's coolant and shielding water were partially or completely drained from the nuclear station irradiated fuel storage ponds where hundreds of tons of irradiated fuel is currently stored or contemplated in future designs. The government analysis states that millions of people within a 500-mile zone might be evacuated for periods ranging from 30 days to one year and that people living within 10 miles might never return to their homes.[9]

The current emergency plan and response for a catastrophic release and radiological consequence from nuclear power stations as presented in NUREG-0654 does not account for these consequences. The current emergency planning standard is arbitrarily and capriciously confined to a 10-mile radius for the emergency planning zone to include sheltering and evacuation procedures and a 50-mile radius for the sheltering of feed stock and other food restrictions.

---

[8] 10 CFR 100.11, http://www.nrc.gov/reading-rm/doc-collections/cfr/part100/part100-0011.html

[9] "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants, " U.S. Nuclear Regulatory Commission and Sandia National Laboratory, October 2000.

As documented by NRC's own reports, the radiological consequences of a catastrophic release can extend far beyond the current planning and response zones. Radiation, once delivered and borne upon the weather system by a transport mechanism of a contaminated steam release, fire or explosion can, as identified by NRC's own studies result in prompt and delayed fatalities, cancers and genetic damage beyond current limited planning and response zones.

NIRS is additionally concerned that large additional inventories of radioactivity to be stored on-site at Independent Spent Fuel Storage Installations (ISFSI) in less robust and less protected dry casks concentrated in tightly grouped configurations in many cases in open line-of-sight for a terrorist attack are 1) not factored into the ESP radiological consequence standard process and; 2) under current NRC ESP application review proceedings considered outside of the scope and challenge of the public hearing process.

NIRS regards this as an effort on the part of the NRC and the industry to unfairly narrow and limit the scope of the ESP process for radiological consequence standards which does not benefit or effectively regulate the public health and safety but instead offers reassurance to the applicant for a prompt and predictable review by the agency.

NIRS regards the attempted limitation of scope of the hearing process to be a violation of the public's due process.

3. The draft guidance for the ESP radiological consequence evaluation does not acknowledge nor factor in previous designs certified by the NRC that were not sufficiently detailed, analyzed and completed so as to contain inaccurate and false assumptions regarding Design Basis Accidents and the integrity vital reactor systems, structures and components. In these cases the agency failed to thoroughly analyze, identify, capture and resolve significant safety issues which linger on at reactor sites today. There is, therefore, ample reason for the public to lack reasonable assurance and confidence in the agency's safety and radiological consequence analyses for Plant Parameter Envelopes that are being offered as surrogates in the absence of scrutable designs proposed for the site.

NIRS re-asserts that the Atomic Energy Commission documents in its "Procedures and Criteria in Safety Evaluation of Nuclear Facilities," June 06, 1957 notes under the section for Site Selection:

"It is impossible to evaluate the safety adequacy of a given site independently of a consideration of the type of reactor to be located there, its characteristics, and the type of facilities to be associated therewith." [10]

The NRC and the nuclear industry have encountered significant standardized design issues and problems where insufficient detail and incomplete designs were found to be flawed long after construction is complete and operating licenses issued. Numerous and

[10] "Procedures and Criteria In Safety Evaluation of Nuclear Facilities," Clifford Beck, US AEC, April 12, 1957, p. 1.

significant safety problems were overlooked in the original design phase, construction and issuance of a operating license. Enough of these safety issues including significant radiological consequence remain unresolved in lingering uncertainties so as to undermine reasonable assurance that the agency can substitute analytical presumptions for scrutable designs.

NIRS offers the following examples as cases in point:

a) General Electric Boiling Water Reactor (BWR) Mark I Pressure Suppression System

Of the 104 nuclear power stations in the United States, there are currently 23 GE BWR Mark I's licensed to operate. The Mark I designs constitute the majority of the 35 operating boiling water reactors in the United States. Controversy over the safety adequacy of the Mark I design has prevailed since the early days of its introduction. In congressional testimony, three of General Electric's top engineers publicly resigned their prestigious positions before the Joint Committee on Atomic Energy in February 1976 over significant design deficiencies and unresolved regulatory issues concluding that the whole system of the Mark I was unsafe. The engineers identified the susceptibility of the Mark I pressure suppression containment system to new and previously unevaluated load phenomenon that would exceed the yield strength of the materials fabricating the containment structure. The consequences of containment failure are frightening. The engineers concluded that if the pressure suppression system failed in the initial phases of a loss-of-coolant-accident, it could result in the failure of the emergency core cooling systems attached to it and the loss of supply of cooling water for the core. The engineers concluded "It is urgent that this problem be seriously evaluated and the wisdom of continued operation of these plants be reconsidered." [11]

The follow-on Safety Evaluation Report for the Mark I Containment Short Term Program (NUREG-0408) issued in December 1977 concluded that the licensed Mark I BWRs may continue to operate without endangering the health and safety of the public.

However, by June 1986, NRC top safety officials urged Mark I operators to give top priority to settle still lingering uncertainties despite previous assurances about the Mark I containments' ability to withstand a severe accident. In a speech before industry, Harold Denton, director of NRC's Office of Nuclear Reactor Regulation to utility officials, "I don't have the same warm feeling about GE containment that I do about the larger dry containments. There has been a lot of work done on these containments, but Mark I containments, especially being smaller with lower design pressure—and in spite of the suppression pool—if you look (at the) WASH (1400) reg safety study, you'll find something like a 90% probability of that containment failing."[12]

---

[11] "Testimony of Dale G. Bridenbaugh, Richard B. Hubbard and Gregory C. Minor before the Joint Committee on Atomic Energy, February 18, 1976, U.S. Congressional Record.

[12] "Denton Urges Industry To Settle Doubts About Mark I Containments," Inside NRC, McGraw Hill Publications, June 8, 1986, p. 1.

In response to these longstanding identified design and safety deficiencies, owners of the faulty GE Mark I containment began installing a back fit on their reactors with a hardened vent of the containment system. The Direct Torus Vent System (DTVS) installed on Mark I reactors now provides operators with the option to deliberately vent an accident that threatens to breach containment by directly releasing the overpressure and radioactivity to the environment bypassing designed station radiation filtration systems in order to save faulted system.

NIRS presents this as one example of how NRC and industry design analysis have failed to capture, adequately evaluate design features that persist to this date with the threat of significant radiological consequence to the public health and safety.

Why should the public have adequate confidence that the NRC now has fully and adequately captured the safety adequacy of a given site proposed under the ESP process using a surrogate Plant Parameter Evaluation without even the benefit of a scrutable design?

b) Pressurized Water Reactor Steam Generator Tube Ruptures with By-pass of Containment

Another example of the NRC failure to adequately capture and mitigate longstanding significant safety deficiencies is offered in the chink in the much touted defense-in-depth strategy for all 69 operating Pressurized Water Reactors in the United States.

When vendors including Westinghouse, Babcock & Wilcox and Combustion Engineering originally offered electric utilities steam generator equipment for Pressurized Water Reactors, the equipment was certified and marketed with an operating life for the 40 year license of the facility. Not only have the certified designs for steam generator systems subsequently been found to contain fundamental design flaws and vulnerabilities not originally seen during the certification process, the alloy and weld material that fabricate these steam generators has since been identified to be subject to an emerging number of premature age-related degradation mechanisms that continue to defy understanding and the ability to prediction crack initiation and crack growth rate.

In a report to NRC prepared by Idaho National Engineering Laboratory, a review of the available information on steam generator tube failures and the impact of these failures on pressurized water reactor safety, the analysis shows that a design basis accident, such as a main steam line break, could lead to a system failure resulting in a core melt accident. Such design basis accidents may cause multiple degraded steam generator tubes to rupture simultaneously or in a cascading guillotine effect. The pressurized core coolant escaping from as few as 15 ruptured tubes can outpace the replacement of water from the emergency core cooling system resulting in reactor core damage. According to the report, the steam generator tube ruptures are risk significant because of the radiological

consequence to the public and environment resulting from a previously unforeseen pathway for radionuclides to by-pass containment.[13]

A Differing Professional Opinion originally filed by a NRC staffer in 1991 on the issue of multiple steam generator tube rupture and by-pass of containment identified that bad science and subjective decision-making is endangering the public health and safety by allowing these utilities to operate with defective steam generator tubes.[14] The NRC has yet to close out the issues of the DPO and the current action plan does not seek to address the associated issues until 2006. In review of the Differing Professional Opinion, the NRC Advisory Committee on Reactor Safeguards (ACRS) determined that the agency needs to better understand the progression of damage that can occur during a design basis accident. The ACRS found "The staff (NRC) does not have a technically defensible analysis of how steam generator tubes, which may be flawed, will behave under severe accident conditions in which the reactor coolant system remains pressurized... The staff needs to develop a more technically defensible treatment of iodine spiking phenomenon associated with design basis events."[15]

NIRS asserts that these findings support our contention that NRC staff has not fully and satisfactorily evaluated the radiological consequence standard for the ESP.

NIRS re-asserts, why should the public have sufficient confidence that the NRC can fully and adequately captured the safety adequacy of a given site in the ESP review process using a surrogate Plant Parameter Evaluation without the benefit of a scrutable design?

Conclusion

For the above stated reasons, NIRS finds the Draft Regulatory Guidance for Early Site Permit Review Standard for Radiological Consequence of Design Basis Accidents to be unacceptable as proposed.

Paul Gunter, Director
Reactor Watchdog Project
NIRS

---

[13] "Steam Generator Tube Failures," NUREG/CR-6365 INEL-95/0383, U.S. Nuclear Regulatory Commission, April 1996, Abstract.

[14] "DPO Says Staff Protecting Utility Financial Interests, Not Safety," David Stellfox, Inside NRC, McGraw Hill Publications, January 31, 2000, p. 1.

[15] "Voltage-Based Alternative Repair Criteria: A Report to the Advisory Committee on Reactor Safeguards by the Ad Hoc Subcommittee on a Differing Professional Opinion," U.S. Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, NUREG-1740, February 01, 2001, Abstract, p. iii.